

C L A I M S

1. A process for the carbonylation of conjugated dienes, whereby an conjugated diene is reacted with carbon monoxide and a hydroxyl group containing compound in the presence of a catalyst system including:

- 5 (a) a source of palladium cations,
(b) a phosphorus-containing ligand
(c) a source of anions,

wherein the phosphorus-containing ligand is a ligand having the general formula I



wherein X^1 and X^2 represent a substituted or non-substituted cyclic group with at least 5 ring atoms, of which one is a phosphorus atom, and R represents a bivalent organic bridging group, connecting both
15 phosphorus atoms, containing from 1 to 4 atoms in the bridge.

2. A process as claimed in claim 1, wherein the conjugated diene is 1,3-butadiene.

3. A process as claimed in claim 1 or 2, wherein the hydroxyl group containing compound is an alkanol with 1 to 6 carbon atoms per molecule.

4. A process as claimed in any one of claims 1 to 3, wherein component (b) of the catalyst system is a phosphorus-containing ligand of formula (I), wherein the bivalent organic bridging group R is an ethylene or a propylene group connected via their terminal carbon atoms to the respective phosphorus atoms of X^1 and X^2 .

5. A process as claimed in any one of claims 1 to 4, wherein X^1 and X^2 represent a substituted or non-substituted bicyclic group with at least 5 ring atoms, of which one is a phosphorus atom.

6. A process as claimed in claim 5, wherein X^1 and X^2 represent a substituted or non-substituted [3,3,1] or [4,2,1] 9-phosphabicyclononyl group.

7. A process as claimed in claim 6, wherein one or both of the phosphabicyclononyl rings is substituted with one or more alkyl groups having from 1 to 4 carbon atoms.

8. A process as claimed in any one of claims 1 to 7, wherein component (c) of catalyst system contains a protonic acid with a pKa value > 1 in aqueous solution at 25 °C or a salt thereof.

9. A process as claimed in any one of claims 1 to 8, wherein 1,3-butadiene is converted into methyl pentenoate and/or dimethyl adipate.

10. A process to prepare caprolactam, Nylon 6, or Nylon 6,6 wherein a compound as prepared according to the process according to any one of claims 1-9, is used as an intermediate.

11. A catalyst system based on:

- (a) a source of palladium cations,
- (b) a phosphorus-containing ligand,
- (c) a source of anions,

wherein the phosphorus-containing ligand is a ligand having the general formula I:



wherein X^1 and X^2 represent a cyclic group with at least 5 ring atoms, of which one is a phosphorus atom, and R represents a bivalent organic bridging group, connecting both phosphorus atoms, containing from 1 to 4 atoms in the bridge and wherein one or both cyclic groups X^1 and X^2 are substituted with one or more alkyl groups having from 1 to 4 carbon atoms.

12. Catalyst system according to claim 11, wherein the phosphorus-containing ligand is 1,2-P,P'bis(1,5-dimethyl, 9-phosphabicyclononyl)ethane.

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13. Use of the catalyst ~~system~~ as claimed in claim 11 or 12, as a carbonylation catalyst.

13. Use of the catalyst system as claimed in claim 11 or 12, as a carbonylation catalyst.